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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/963,638	09/27/2001	Daewon Kwon	178.39931X00	9281

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EXAMINER	
STOCK JR, GORDON J	

ART UNIT	PAPER NUMBER
2877	

DATE MAILED: 10/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/963,638	KWON, DAEWON	
	Examiner	Art Unit	
	Gordon J Stock	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-34* is/are pending in the application.

4a) Of the above claim(s) *13-23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-12 and 24-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 1-4, 6, 11, 12, 24-34** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Zawaideh (5,999,267)** in view of **Jellison et al. ("Parameterization of the optical functions ... interband region")** further in view of **Adachi ("Optical dispersion relations for Si and Ge")** further in view of **Solomon et al. (5,900,633)**

As for **claims 1-4, 6, 24-27, 30-34,** Zawaideh in a nondestructive optical technique discloses a system that gathers reflectometric and ellipsometric data, a first means for measuring a physical/optical property of a film such as thickness, refractive index, and extinction coefficient (Figs. 1-2; col. 1, lines 50-65; col. 2, lines 1-30); whereas, the system comprises a computer, second means, for calculating at least one parameter of the film using measured data and a model and the system measures an optical property containing interband states (col. 3, lines 10-25; col. 4, lines 30-65). As for using a model for relating scattering caused by interband states and the model taking into account transitions between a band and interband states in a band gap of film using quantum mechanical transition equations, Zawaideh is silent. However, he does use models from Jellison (col. 4, lines 32-40). Jellison implies scattering is used in the modeling of silicon by mentioning surface roughness (col. 1, paragraph 1), and Jellison teaches that optical parameters are derived through quantum mechanical transitions between interband and band states using quantum mechanical transition equations (E and E_g of equation 1). Also

Adachi in optical dispersion relations for Si discloses that optical functions are dependent upon indirect band gap transitions, dispersion mechanisms (col. 1, paragraphs 1-2; col. 2, paragraph 2) and that optical constants are dispersed by interband transitions (Fig. 2) and that optical parameter modeling using transitions between interband and band states with quantum mechanical transition equations (column 2, lines 3-4). And Solomon in a method and analysis system for film thickness teaches that there is scattering with interbands and using a model to compute silicon optical properties (col. 7, lines 58-67; col. 8, lines 1-65). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the calculating at least one physical parameter of a film comprise a model that relates scattering to interband states taking into account transitions between band and interband states with quantum mechanical transition equations, for the scattering and dispersion caused by interband transitions affect optical functions of films and models which utilize energy differences which relate to quantum mechanical transition equations between interband and band states. As for a machine-readable medium containing at least one sequence of instructions, Zawaideh discloses a measurement processor with algorithms (Fig. 1: 18, 17; Figs. 2 and 3).

As for **claims 11 and 12**, Zawaideh in view of Jellison, Adachi, and Solomon disclose everything as above (see **claim 1**). In addition, Zawaideh discloses the measurement of dielectric and semiconductive materials (col. 5, lines 10-15). Zawaideh is silent concerning the material containing at least one alien species as an impurity. However, doping is well-known in the art to manipulate electron flow in a semiconductor. And Solomon teaches measuring doped materials in order to account for doping in modeling in order to determine impurities in films (col. 7, lines 38-57). Therefore, it would be obvious to one of ordinary skill in the art at the time

the invention was made to have a tested semiconductor material comprise an impurity in order to adjust modeling parameters to be able to identify impurities in otherwise pure samples through testing.

As for **claims 28-29**, Zawaideh in view of Jellison, Adachi, and Solomon disclose everything as above (see claim 28-29). Zawaideh is silent concerning the uv range, but uses Jellison's modeling (col. 4, lines 32-40). Jellison teaches modeling and computation in the uv range (Fig. 1). Therefore, it would be obvious to one skilled in the art to have the system have the model be over a range of wavelengths including the uv region in order to have a complete wavelength profile of the film and to accurately determine the refractive index and extinction coefficient functions for they are wavelength dependent.

3. **Claims 7-10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Zawaideh (5,999,267)** in view of **Jellison et al. ("Parameterization of the optical functions ... interband region")** further in view of **Adachi ("Optical dispersion relations for Si and Ge")** further in view of **Solomon et al. (5,900,633)** and further in view of the applicant's disclosure of prior art.

As for **claim 7**, Zawaideh in view of Jellison, Adachi and Solomon discloses everything as above (see **claim 6**). They are silent concerning the specific dielectric function. However, applicant's disclosure of page 11 teaches a prior art equation of Bourgoin (page 11, lines 5-10). And Jellison suggests the equation (column 1: equation 1; whereas, $\varepsilon_2 = A_T(E-E_g)^{1/2} \times (E-E_g)^{1/2}/E^2$). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to use this specific equation, for it takes into account interband transitions and Zawaideh utilizes Jellison's models.

As for **claim 8**, Zawaideh in view of Jellison, Adachi, Solomon, and the applicant's disclosure of prior art discloses everything as above (see **claim 7**). They are silent concerning the specific dielectric function. However, applicant's disclosure states that the equation is from the Kramer Konig relation (page 11, lines 11-15). And Jellison mentions using Kramers-Kronig integration (cols. 2-3). Therefore, it would be obvious to one skilled in the art at the time to use the specific dielectric function, for Kramer Konig integration is used and the parameterization takes into account interband transitions, and again, Zawaideh uses Jellison's models.

As for **claim 9**, Zawaideh in view of Jellison, Adachi, Solomon, and the applicant's disclosure of prior art discloses everything as above (see **claim 8**). Zawaideh is silent concerning the specific refractive index and extinction coefficient relations. However, Adachi appears to use the relations of n and k without SI units (equations 23 and 24). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to use the specific refractive index and extinction coefficient relations, for these relations take into account interband and band transitions and scattering/dispersion related to interband states in films.

As for **claim 10**, Zawaideh in view of Jellison, Adachi, Solomon, and the applicant's disclosure of prior art discloses everything as above (see **claim 7**). In addition, Zawaideh discloses using reflectometry and ellipsometry (Figs. 1-2; col. 1, lines 50-65; col. 2, lines 1-30).

Response to Arguments

4. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. However, with arguments in Remarks of July 28, 2004 in regards to Jellison and Adachi pages 15-20, Examiner found them persuasive in view of Halliyal et al., but they are not persuasive in view of **Solomon et al. (5,900,633),** for they are

arguments concerning solely the separate bodily incorporation of Adachi and Jellison's models within the Zawaideh reference, and do not take into account the bodily incorporation of Solomon's model with Jellison and Adachi. Though Jellison implies scattering is used in the modeling of silicon by mentioning surface roughness (col. 1, paragraph 1), and Jellison teaches that optical parameters are derived through quantum mechanical transitions between interband and band states using quantum mechanical transition equations (E and E_g of equation 1) and though Adachi in optical dispersion relations for Si discloses that optical functions are dependent upon indirect band gap transitions, dispersion mechanisms (col. 1, paragraphs 1-2; col. 2, paragraph 2), in view of Solomon, Solomon teaches the measurement of thickness of films uses a model that takes into account scattering related to interband states within the dielectric function utilizing all phonon modes and electrically inactive impurity modes in the dielectric function (Solomon: col. 8, lines 50-55). Therefore, the rejections under 35 U.S.C. 103(a) are from the combined teachings of Zawaideh, Jellison, Adachi, and Solomon rather than from separate teachings. The test for obviousness is not whether the features of secondary references may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

U.S Patent 6,326,650 to Allam (specifically, scattering with interband transitions of column 12, lines 10-30)

U.S. Patent 6,392,756 to Li et al. (specifically, film measurements in the UV range of Fig. 3)

Fax/Telephone Numbers

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and

2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: **(703) 872-9306**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (571) 272-2431. The examiner can normally be reached on Monday-Friday, 10:00 a.m. - 6:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached at 571-272-2800 ext 77.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private Pair system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

gs
October 13, 2004

Zandra V. Smith
Primary Examiner
Art Unit 2877